STEM & Robotics ERP PRO Set

ADVANCED EDITION

E35.1 ROBOTICS Lessons

The **STEM & Robotics ERP PRO Advanced Edition education set** is specially designed for Primary and Secondary school students. It combines the core subjects of STEM together with Robotics and includes high-level projects that lead to a deeper understanding of the underlying theory while also developing 21st century skills. The set comes in a convenient plastic storage tub that contains a large number of Engino structural and technical parts, together with advanced robotic devices such as ERP Pro controller, DC motors, a servo motor, LEDs, touch sensor, IR sensors, ultrasonic sensor and a gyroscope/accelerometer sensor with all necessary connecting cables. The set allows the construction of more than 10 **Robotic models** and 60 **STEM models**.

Engino® EDUCATION

9-12

Edition: 02/23

Lesson: Motorised house

Outputs - DC Motor, Servo Motor & Buzzer

Motors and servomechanisms are the most common outputs on a robot. They can give motion to the robot itself or change the position of its movable parts. Another common type of output is the buzzer which emits auditory signals. Learn how to command outputs using the flow diagram and unlock programming skills!

Discover:

- How DC motor and a servo motor work.
- Output action blocks and their properties.
- How to program using the flow diagram.

Materials Needed:

- Engino® STEM & Robotics ERP PRO.
- PC or tablet with KEIRO™ software installed.

Procedure:

1. Find the building steps in the **instructions section** to build the **High-tech House** model.

2. Switch on the Pro controller and connect it to a PC through the USB cable. Open KEIRO™ software and connect the two devices by clicking on the appropriate button. Follow **exercise 1** to configure the simulator.

3. The garage door is open and waits for a car to be parked inside! Place an LED on the top and connect it to any port. Read **exercise 2** to learn how to operate the garage door. Then send the program to the controller and test it.

4. Click on the appropriate icon at menu bar to **save** the program on the PC.

5.. The servo motor works differently compared to the DC motor. It rotates in degrees, completing a semi-circle of 180°. Do the program of **exercise 3** and find how to open and close the house door with a servo.

6. By now you have used most of the output blocks. Read **exercise 4** to have an overview of the available properties that can affect the operation of an output.

Engino® High-tech house

Exercise 1: Expand the simulator panel and assign the ports to the connected peripherals as they appear on your model. Drag and drop the proper icon blocks to the ports.

Exercise 2: Drag and drop the appropriate action blocks beneath the "Start" block on the flow diagram to make the following program:

- *garage door closes;*
- *then, the buzzer emits a C5 sound signal for 1 second;*
- *the door opens again;*
- *the buzzer emits a C5 sound and the LED is on for 2".*

Tip: Examine the properties of action blocks and adjust them to achieve this. Also, experiment with the duration time and/or speed of the motor to achieve a fine tuning of the door.

Exercise 3: Drag and drop the necessary action blocks into the flow diagram to create the following sequence of commands:

- *The door closes and a buzzer tone follows for 0.5 seconds;*
- *then, the door widely opens;*
- *the door remains open for 3 seconds;*
- *and finally the door closes back.*

Tip: Servo motor has a finite upper limit on rotation speed to secure precise rotation. Hence, by giving a short duration interval may not lead to the desired outcome.

Exercise 4. Place a tick (✓) into the cells of the table to indicate which variables are available for each of the following outputs.

Properties / Outputs	port	state	direction	speed	angle	music note	frequency	delay	duration	sequence

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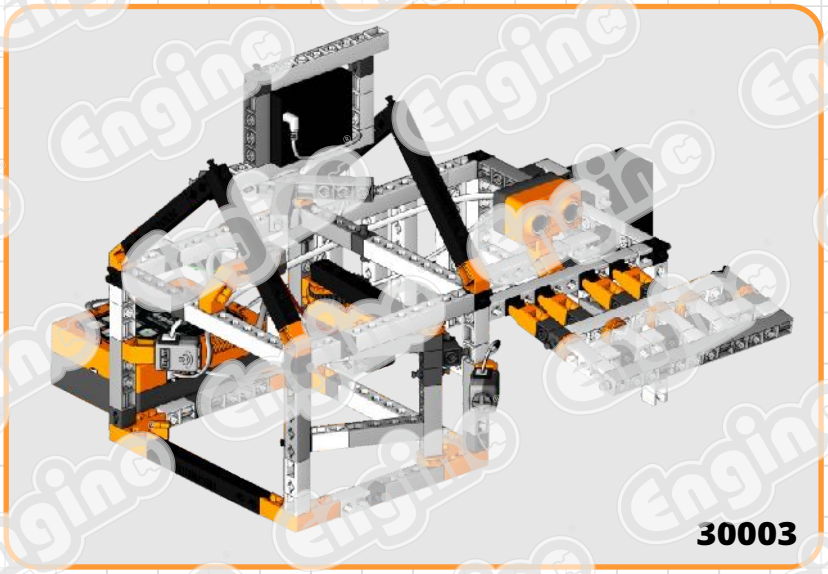

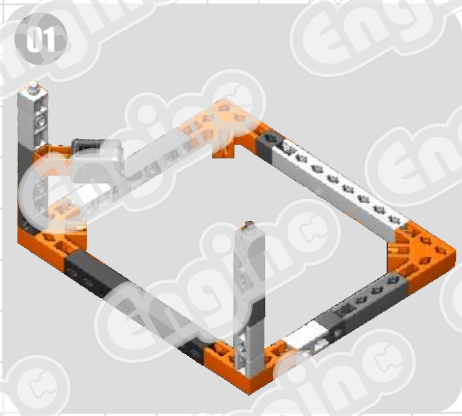

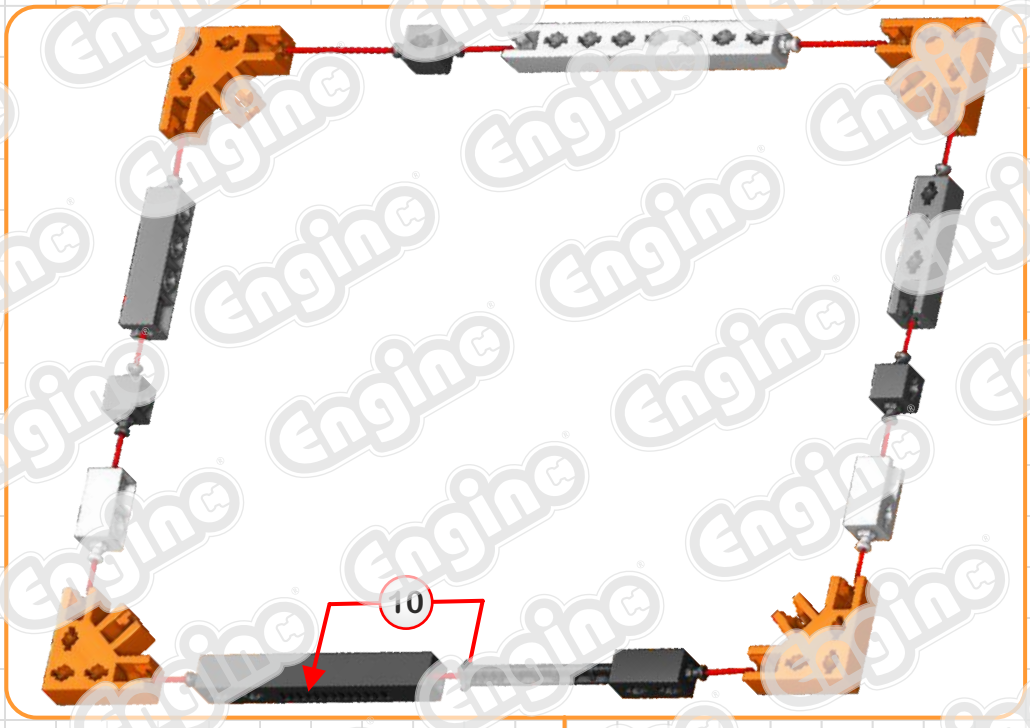

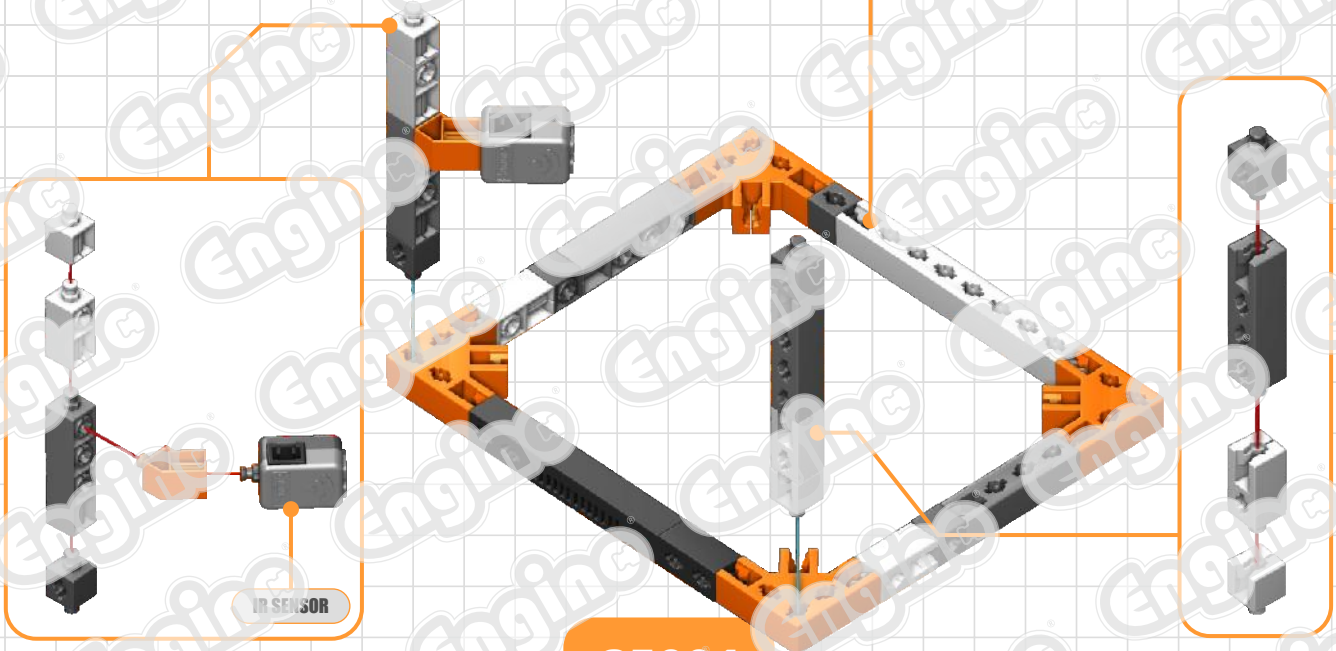

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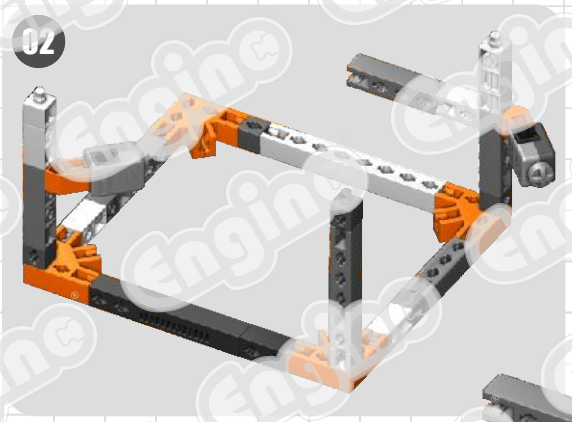

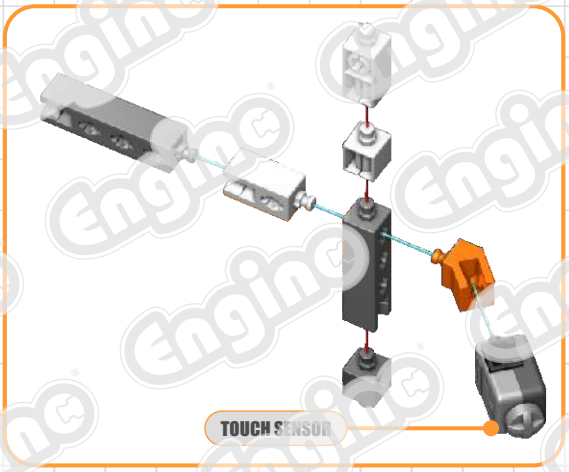

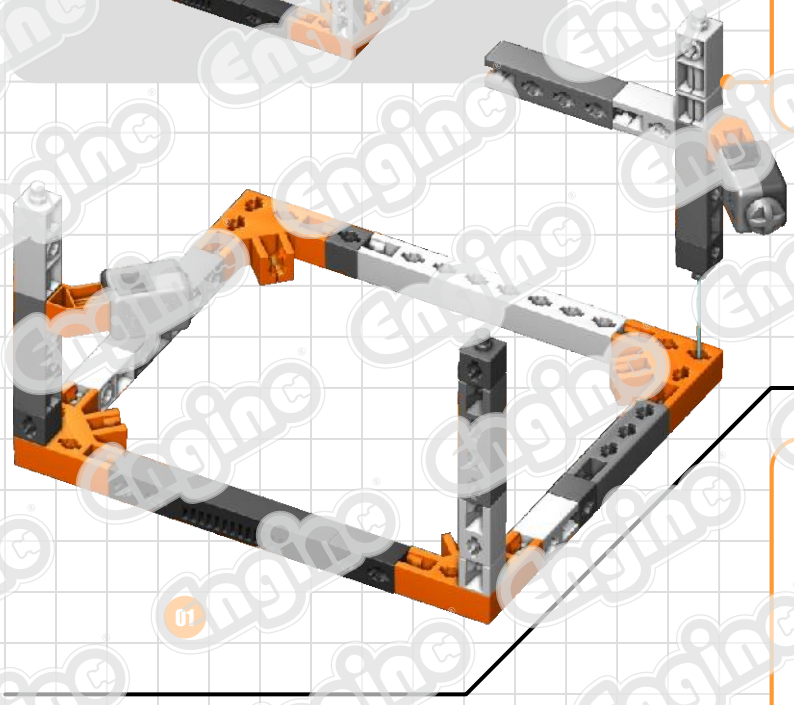

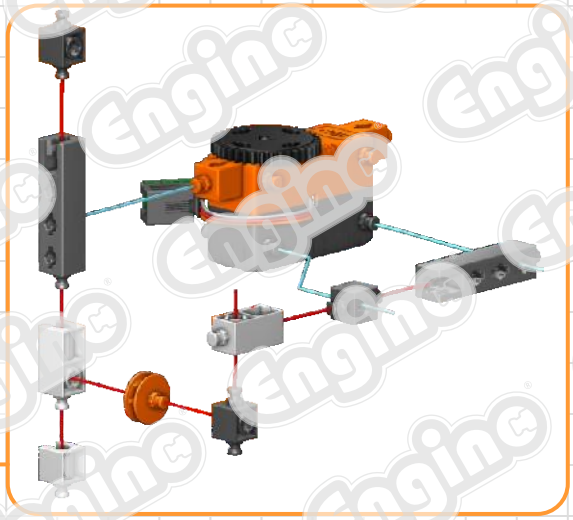

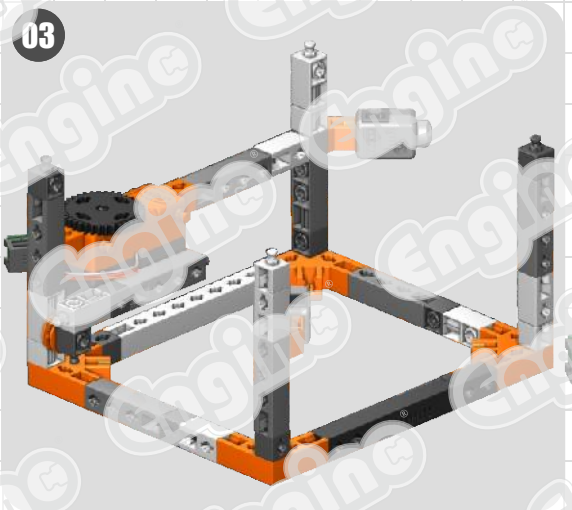

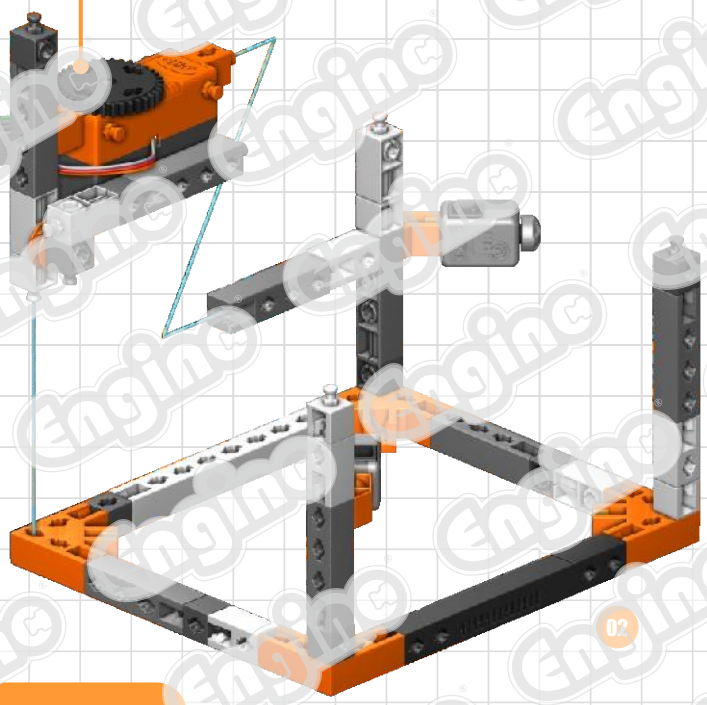

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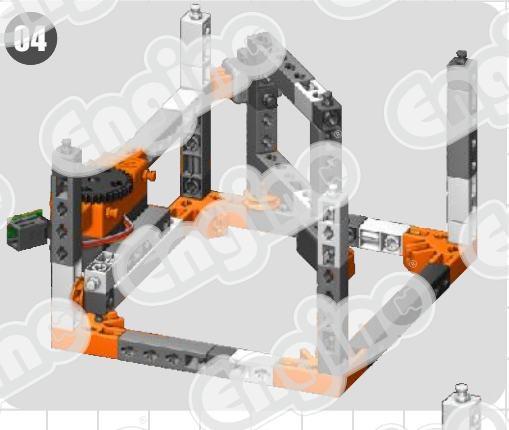

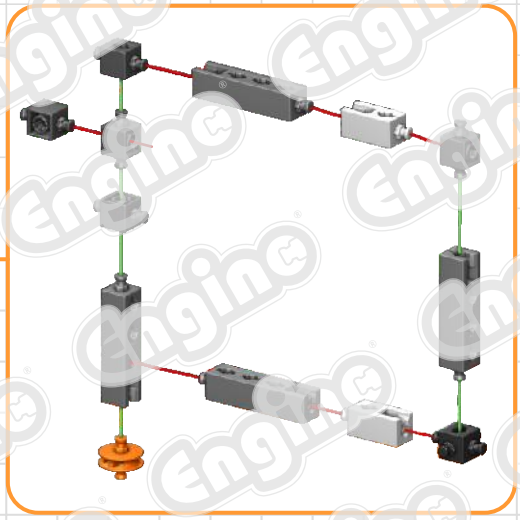

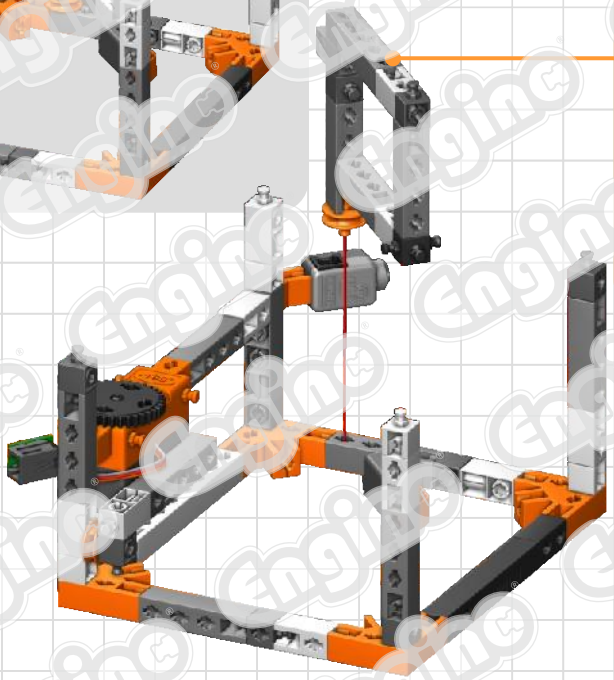

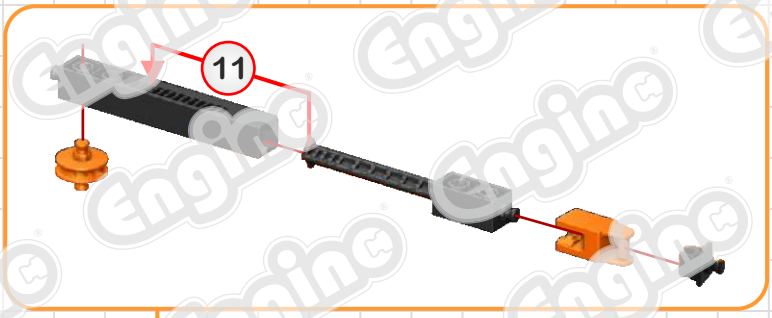

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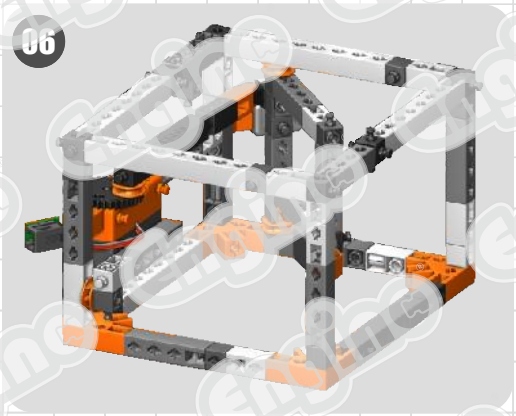

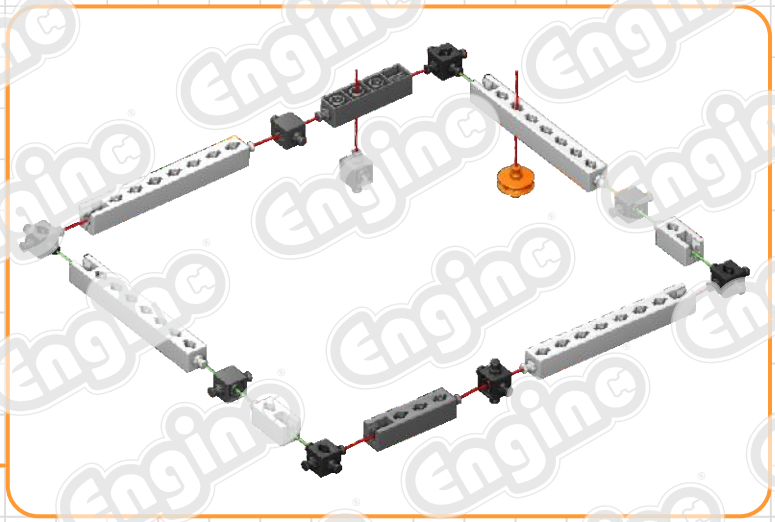

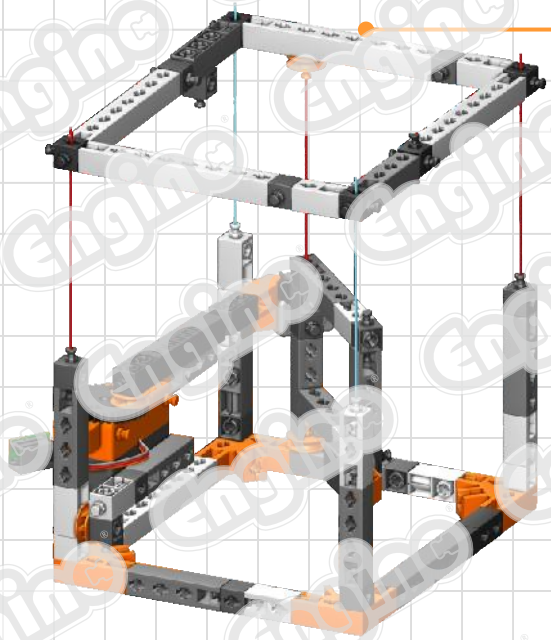

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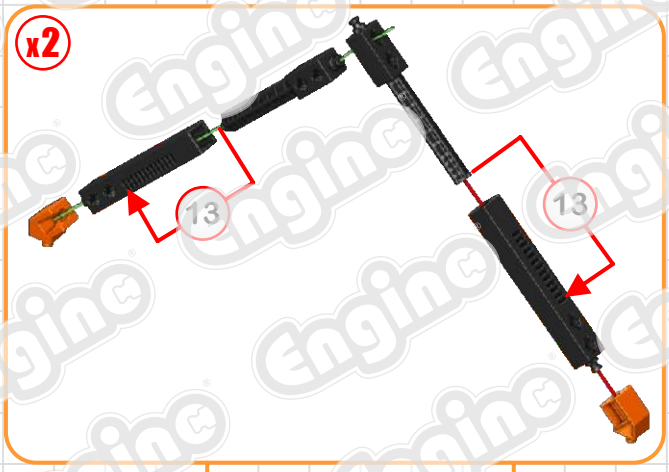

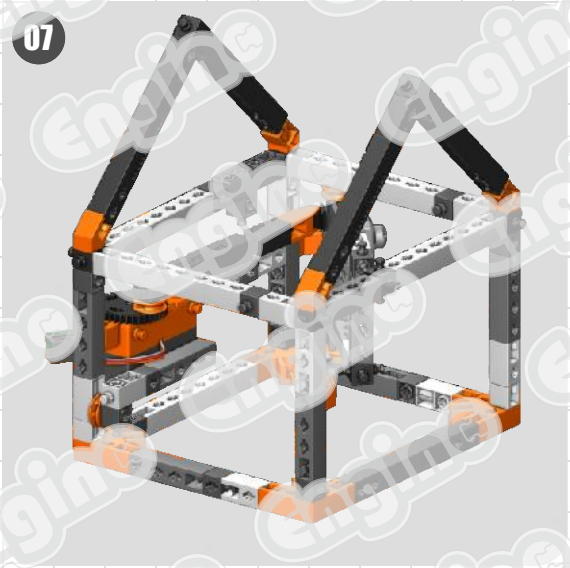

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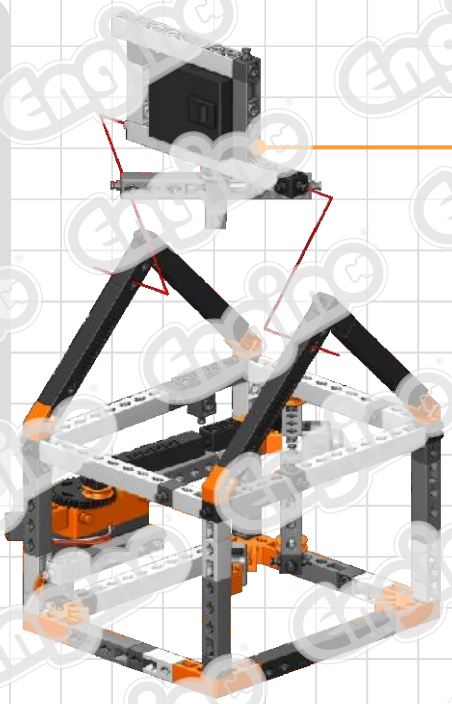

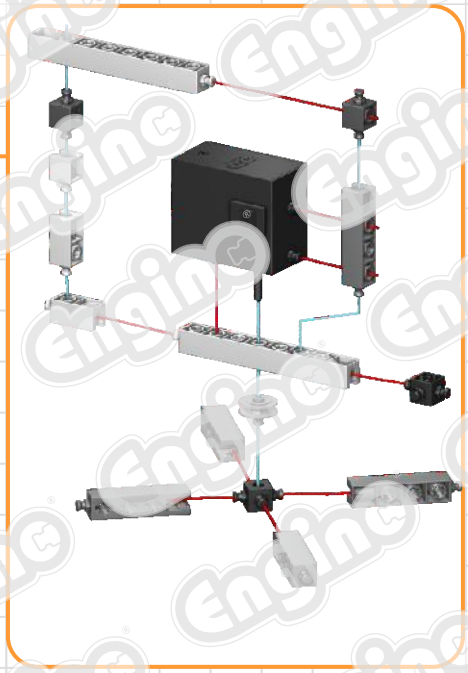

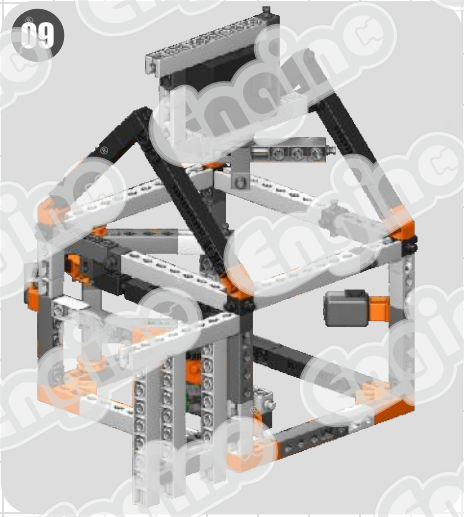

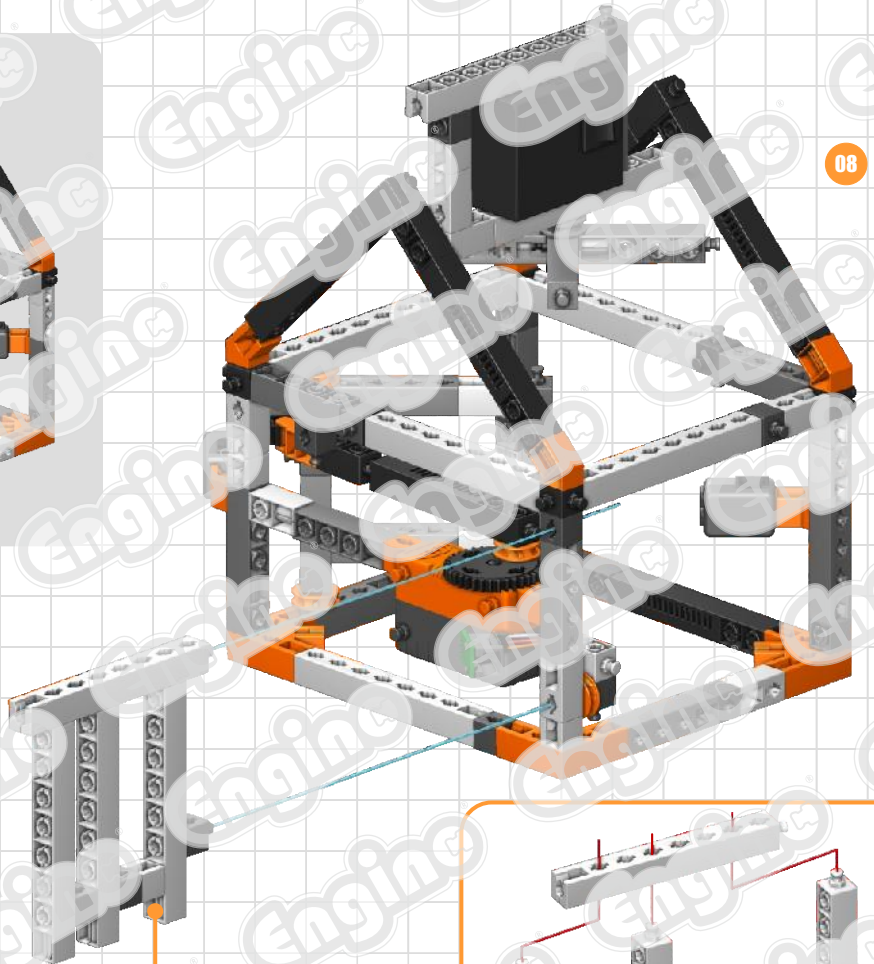

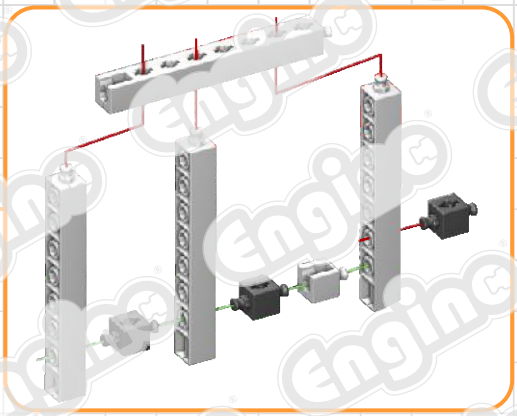

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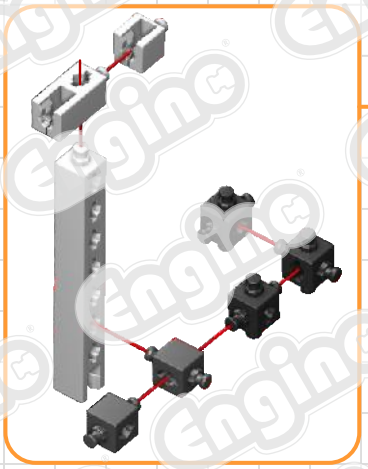

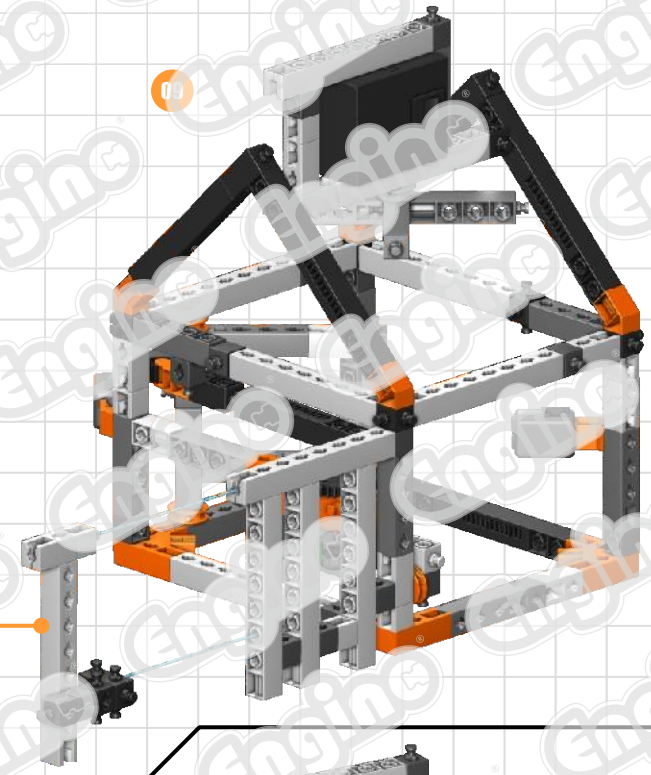

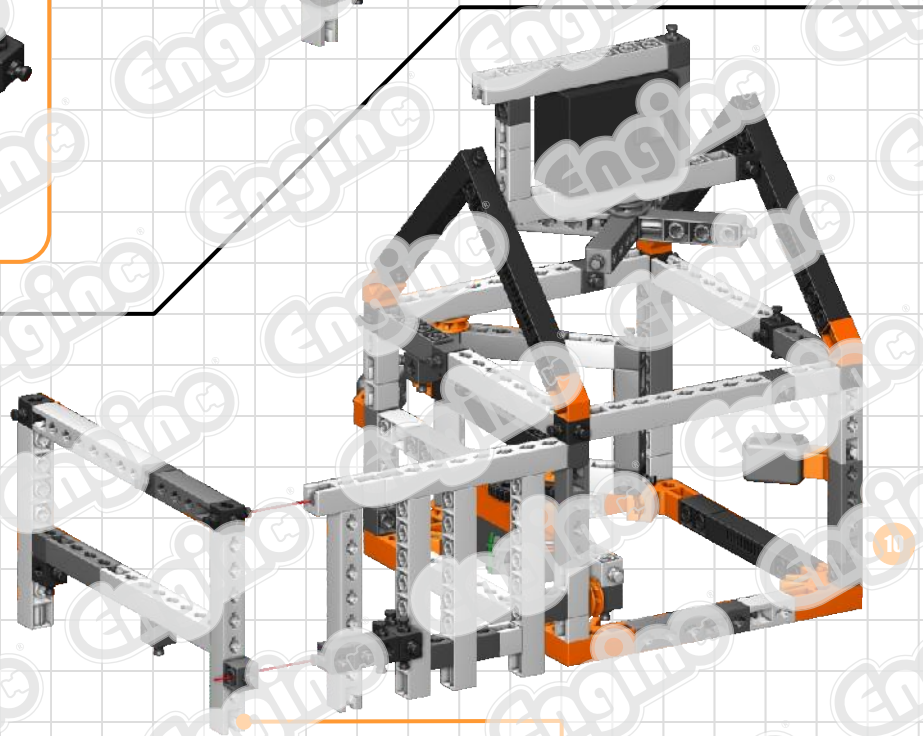

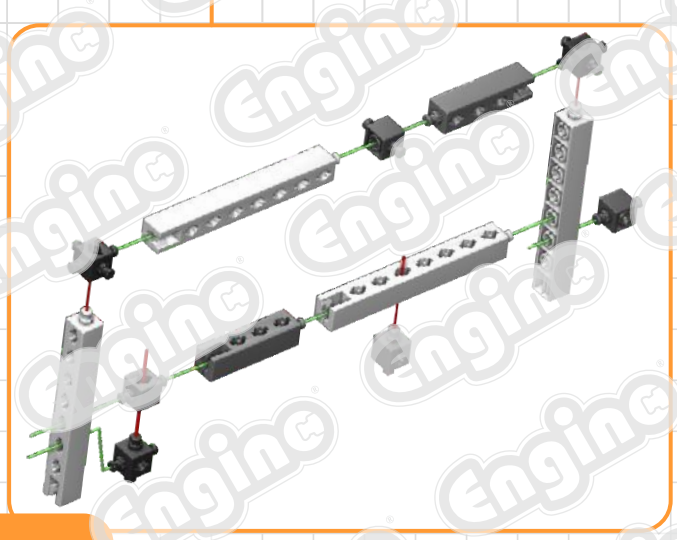

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